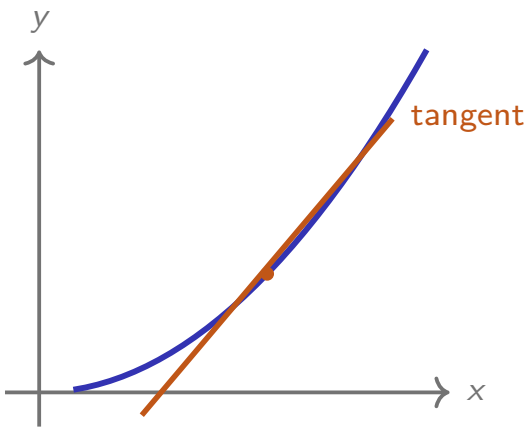
Exercise walk-through

2.5
Applying the Power Rule

AP Calculus BC

What we will cover

1. Average vs instantaneous rate
2. The derivative as a limit
3. When a derivative exists
4. Basic derivative rules
5. Product & quotient rules
6. Trig, exp & log derivatives



The power rule

The **power rule** handles any real power:

$$\frac{d}{dx}x^r = rx^{r-1}.$$

> Rewrite as a power first: $\frac{1}{x} = x^{-1}$, $\sqrt{x} = x^{1/2}$.

$$x^5 \to 5x^4$$

$$\frac{1}{x} = x^{-1} \to -x^{-2}$$

$$\sqrt{x} = x^{1/2} \to \tfrac{1}{2}x^{-1/2}$$

Unit 2 – key takeaways

1 The derivative

the limit of the secant slope – the tangent's gradient

2 Existence

differentiable $\Rightarrow$ continuous; corners and vertical tangents fail

3 The rules

power, constant multiple, sum; product and quotient

4 Building blocks

$\sin$, $\cos$, e^x, $\ln x$ – know them by heart

Exercises 2.1·2.3

2.1 State the power rule. [1]

2.2 Differentiate x^5. [1]

2.3 Differentiate x^2 and x. [2]

Exercises 2.1·2.3

2.1 State the power rule. [1]

2.1

- $\dfrac{d}{dx}[x^n] = n\,x^{n-1}$

2.2 Differentiate x^5. [1]

2.2

- $5x^4$

2.3 Differentiate x^2 and x. [2]

2.3

- $\dfrac{d}{dx}[x^2] = 2x$; $\dfrac{d}{dx}[x] = 1$

Exercise 3.1

3.1 $\dfrac{d}{dx}[x^n]$ equals [1]

A x^{n-1}

B $n\,x^{n-1}$

C $n\,x^n$

D $\dfrac{x^{n+1}}{n+1}$

Exercise 3.1

3.1 $\dfrac{d}{dx}[x^n]$ equals [1]

- **A** x^{n-1}
- **B** $n\,x^{n-1}$
- **C** $n\,x^n$
- **D** $\dfrac{x^{n+1}}{n+1}$

3.1 B

- $n\,x^{n-1}$.

Exercise 3.2

3.2 $\frac{d}{dx}[x^4]$ equals [1]

A $4x^3$

B x^3

C $4x^5$

D $3x^4$

Exercise 3.2

3.2 $\dfrac{d}{dx}[x^4]$ equals [1]

A $4x^3$
B x^3
C $4x^5$
D $3x^4$

3.2 A

- $4x^3$.

Exercise 3.3 (a)

3.3 Differentiate each.

(a) x^6. [1]

Exercise 3.3 (a)

3.3 Differentiate each.

(a) x^6. [1]

(a)

- $6x^5$

Exercise 3.3 (b)

3.3 Differentiate each.

(b) x. [1]

Exercise 3.3 (b)

3.3 Differentiate each.

(b) x. [1]

(b)

- 1

Exercise 3.3 (c)

3.3 Differentiate each.

(c) 7 (a constant). [1]

Exercise 3.3 (c)

3.3 Differentiate each.

(c) 7 (a constant). [1]

(c)

- 0